Title: Contact arrangement for electric switching devices.

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Abstract

Contact arrangement for electric switching devices, particularly intended for current-limiting low-voltage circuit breakers, with a double-break movable contact arm (1), the central part of which is attached to an insulating shaft (3,4) which is rotatably journalled in elongated holes (7) in stand parts (9) on each side of the contact arm (1). In the closed position of the arrangement, the movable contact arm is pressed against two U-shaped stationary contact arms (2) with the aid of two torsion springs (5,6). The contact arms (1,2) have a flat shape and are arranged with their broad sides facing each other. The shaft (3,4) consists of two sleeve-formed holders surrounding the torsion springs. One holder (4) exhibits a stop face (12) for a latching member (8) for arresting the movable contact arm in the open position.

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(54) Contact arrangement for electric switching devices.

(57) Contact arrangement for electric switching devices, particularly intended for current-limiting low-voltage circuit breakers, with a double-break movable contact arm (1), the central part of which is attached to an insulating shaft (3,4) which is rotatably journalled in elongated holes (7) in stand parts (9) on each side of the contact arm (1). In the closed position of the arrangement, the movable contact arm is pressed against two U-shaped stationary contact arms (2) with the aid of two torsion springs (5,6). The contact arms (1,2) have a flat shape and are arranged with their broad sides facing each other. The shaft (3,4) consists of two sleeve-formed holders surrounding the torsion springs. One holder (4) exhibits a stop face (12) for a latching member (8) for arresting the movable contact arm in the open position.

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Claims

1. Contact arrangement for electric switching devices comprising a double-break movable contact arm (1), the central part of which is attached to a shaft (3, 4) which is rotatably journalled in bearing holes (7) in stand parts (9) on either side of the contact arm (1), the contact arm (1) being rotatable between a closed and an open position and being arranged to be pressed, in the closed position, with the aid of contact pressure springs (5,6) against two stationary contact arms (2) which are each arranged at a respective end of the movable contact arm, the movable contact arm (1) having an elongated cross-section and being arranged with its large cross-sectional dimension substantially perpendicular to the plane of rotation, characterized in that the bearing holes (7), arranged in the stands (9) for the shaft (3,4) of the movable contact arm are elongated and orientated such that the movable contact arm (1) can be displaced transversely in the plane of rotation, and that the shaft (3,4) exhibits a stop face (12) for a latching member (8) for arresting the movable contact arm (1) in the open position.

2. Contact arrangement according to claim 1, characterized in that the fixed contact arms (2) are U-shaped.

3. Contact arrangement according to claim 1 or 2, characterized in that the shaft (3,4) is made of insulating material.

4. Contact arrangement according to any of the preceding claims, characterized in that the shaft (3,4) consists of two substantially cylindrical, sleeve-shaped holders, arranged on each small side of the movable contact arm, the end surfaces of said holders facing the movable contact arm being provided with diametrically arranged fixing slots (11) adapted to the cross-sectional dimensions of the contact arm (1).

5 Contact arrangement according to any of the preceding claims, characterized in that the contact pressure springs (5,6) consist of torsion springs which are enclosed in the shaft (3,4) for the movable contact arm (1).

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(57) Contact arrangement for electric switching devices, particularly intended for current-limiting low-voltage circuit breakers, with a double-break movable contact arm (1), the central part of which is attached to an insulating shaft (3,4) which is rotatably journalled in elongated holes (7) in stand parts (9) on each side of the contact arm (1). In the closed position of the arrangement, the movable contact arm is pressed against two U-shaped stationary contact arms (2) with the aid of two torsion springs (5,6). The contact arms (1,2) have a flat shape and are arranged with their broad sides facing each other. The shaft (3,4) consists of two sleeve-formed holders surrounding the torsion springs. One holder (4) exhibits a stop face (12) for a latching member (8) for arresting the movable contact arm in the open position.

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Contact arrangement for electric switching devices

The invention relates to a contact arrangement for electric switching devices according to the precharacterising part of claim 1.

The invention is primarily related to contact arrangements for current-limiting circuit breakers for rated operating voltages of up to about 1000 V, but, in principle, it may be used also for other types of low-voltage switching devices.

An electric switching device with rotatably journalled movable contacts and two series-connected breaking points per pole is previously known from DE-A-2 845 950. In this switching device the movable contact is attached together with the contact pressure springs in a diametrically through-going hole in a shaft of insulating material. This hole must be sufficiently large to accommodate the spring movement of the contact. For this reason the shaft must have a relatively large diameter, which entails a relatively large mass of the movable system. This is a disadvantage, especially in current-limiting circuit breakers, since the larger movable mass results in lower contact acceleration upon breaking, which reduces the breaking capacity.

In a contact device of a similar kind disclosed in EP-B-0 174 904, in which a double-break movable contact arm has a central bearing arrangement, the movable contact arm exhibits an elongated bearing hole, the longitudinal axis of which is directed perpendicular to the longitudinal axis of the contact arm. This enables the contact arm to be displaced, within certain limits, transversely in the plane of rotation so that approximately the same contact pressure is achieved at the two breaking points, independently of manufacturing tolerances, contact wear, etc. Furthermore, the movable contact arm is formed with stop faces for two catches which constitute parts of a coupling shaft. A drawback with this design is that the movable contact arm will have large cross-sectional dimensions in the plane of rotation in relation to the dimension perpendicular thereto. This means that the electrodynamic repulsion forces, which act on the movable contact arm upon a short circuit, become lower than in contact arms which have their main cross-sectional extension perpendicular to the plane of rotation, since the average distance between the antiparallel current lines in the contact arms becomes larger. This results in slower contact separation and reduced breaking capacity.

The invention aims at developing a contact arrangement for electric switching devices of the above-mentioned kind, particularly for current-limiting circuit breakers, which exhibits relatively small movable masses, develops high electrodynamic repulsion forces acting on the movable contact arm upon the occurrence of a short-circuit, and ensures substantially equal contact pressure at both series-connected contact points.

To achieve this aim the invention suggests a contact arrangement for electric switching devices according to the introductory part of claim 1, which is characterized by the features of the characterizing part of claim 1.

Further developments of the invention are characterized by the features of the additional claims.

Since the contact arms are of flat shape and face each other with their broad sides, high electrodynamic repulsion forces will develop, which bring about a rapid contact separation upon a short circuit. Since the bearing holes, provided in the stands for the shaft of the movable contact arm are elongated and oriented such that the movable contact arm can be displaced transversely in the plane of rotation, the further advantage is achieved that the contact forces at the two series-connected contact points are at least approximately equally great. By arranging stop faces for latching members, etc., on the shaft fixed at the movable contact arm and not on the contact arm itself, as in the prior art embodiment described above, a simpler contact arm is achieved which makes replacements of contacts easier and less expensive.

The shaft for the movable contact arm may suitably consist of one or two substantially cylindrical, sleeve-formed holders with fixing slots for fixing the holders on the movable contact, the holders being arranged on each small side of the contact. These holders may suitably accommodate the contact pressure springs, being preferably formed as torsion springs, which, inter alia, results in the advantage that the springs are protected against metal spatter from the contact points.

By way of example, the invention will now be described in greater detail with reference to the accompanying drawings showing in

Figure 1 an exploded perspective view of a contact arrangement according to the invention,

Figure 2 schematically the configuration of the current path of this contact arrangement,

Figure 3 in perspective view the movable contact arm of the contact arrangement with a shaft mounted thereon,

Figure 4 schematically the bearing arrangement of the shaft

Figure 5 schematically, in the same way as Figure 2, an alternative embodiment of the contact arrangement.

The contact arrangement shown in Figures 1 and 2 comprises a double-break movable contact arm 1, the central part of which is attached to a

shaft consisting of two substantially cylindrical, sleeve-formed holders 3, 4 of a suitable plastic material, the holders being coaxially arranged on opposite edges of the movable contact arm. The shaft 3, 4 is journalled in bearing holes 7 in the stand part 9 arranged on either side of the movable contact arm and is rotatable between a closed and an open position. In the closed position the movable contact arm is pressed with the aid of contact pressure springs in the form of two torsion springs 5, 6 against two U-shaped stationary contact arms 2, which are each arranged at a respective end of the movable contact.

The two holders 3, 4 which form the shaft of the movable contact arm are provided, at the end surfaces facing the contact arm, with diametrically arranged slots 11 in which the contact arm 1 is fixed (Fig. 3). The fixing of the movable contact arm in the axial direction in the holders 3, 4 may, for example, be achieved by providing, in the centre of the narrow sides of the contact arm along a distance corresponding to the diameter of the holders, for example 0.5 mm deep recesses (e.g. by milling or punching), in which the holders engage.

One of the holders, 4, exhibits a stop face 12 for a spring-loaded latching member 8, which engages and retains the movable contact arm in the open position once the contact distance has exceeded a predetermined value.

The two torsion springs 5, 6 are each housed in a respective one of the sleeve-shaped holders 3, 4. The springs are fixed with one end to the respective holder 3, 4 and with the other end to the respective side wall 9.

As will be clear from Figure 4, those bearing holes 7 for the holders 3, 4 which are arranged in the side walls 9 are elongated and oriented such that the longitudinal axis 13 of the respective hole is parallel to a line directed approximately perpendicular to the longitudinal axis of the movable contact arm 1. The largest transverse dimension da of the holes is considerably larger than their smallest transverse dimension d_2 which, in turn, is somewhat larger than the diameter d_1 of the holders 3, 4. With this embodiment the advantage is achieved that the movable contact arm is, in principle, self-adjusting so that approximately the same contact force arises at the two series-connected contact points, independently of, for example, uneven contact wear.

The contact pressure springs 5, 6 need not necessarily consist of torsion springs but may instead consist of, for example, compression springs wound in the form of spiral springs and arranged as shown in Figure 5.

When a short-circuit current flows through the contact arrangement shown, the movable contact arm, because of the configuration of the fixed current paths and the flat shape of the contact arms which gives a short distance between the antiparallel current lines, will be influenced by strong electrodynamic repulsion forces. In this way a rapid contact separation and an efficient limitation of the short-circuit current are attained.

The invention is not limited to the embodiment shown but can be materialized in many different ways within the scope of the claims. For example, the shaft, 3, 4 need not necessarily consist of two parts but can be designed as one integrated part.

Claims

1. Contact arrangement for electric switching devices comprising a double-break movable contact arm (1), the central part of which is attached to a shaft (3, 4) which is rotatably journalled in bearing holes (7) in stand parts (9) on either side of the contact arm (1), the contact arm (1) being rotatable between a closed and an open position and being arranged to be pressed, in the closed position, with the aid of contact pressure springs (5,6) against two stationary contact arms (2) which are each arranged at a respective end of the movable contact arm, the movable contact arm (1) having an elongated cross-section and being arranged with its large cross-sectional dimension substantially perpendicular to the plane of rotation, **characterized** in that the bearing holes (7), arranged in the stands (9) for the shaft (3,4) of the movable contact arm are elongated and orientated such that the movable contact arm (1) can be displaced transversely in the plane of rotation, and that the shaft (3,4) exhibits a stop face (12) for a latching member (8) for arresting the movable contact arm (1) in the open position.

2. Contact arrangement according to claim 1, **characterized** in that the fixed contact arms (2) are U-shaped.

3. Contact arrangement according to claim 1 or 2, **characterized** in that the shaft (3,4) is made of insulating material.

4. Contact arrangement according to any of the preceding claims, **characterized** in that the shaft (3,4) consists of two substantially cylindrical, sleeve-shaped holders, arranged on each small side of the movable contact arm, the end surfaces of said holders facing the movable contact arm being provided with diametrically arranged fixing slots (11) adapted to the cross-sectional dimensions of the contact arm (1).

5 Contact arrangement according to any of the preceding claims, **characterized** in that the contact pressure springs (5,6) consist of torsion springs which are enclosed in the shaft (3,4) for the movable contact arm (1).

FIG. 1

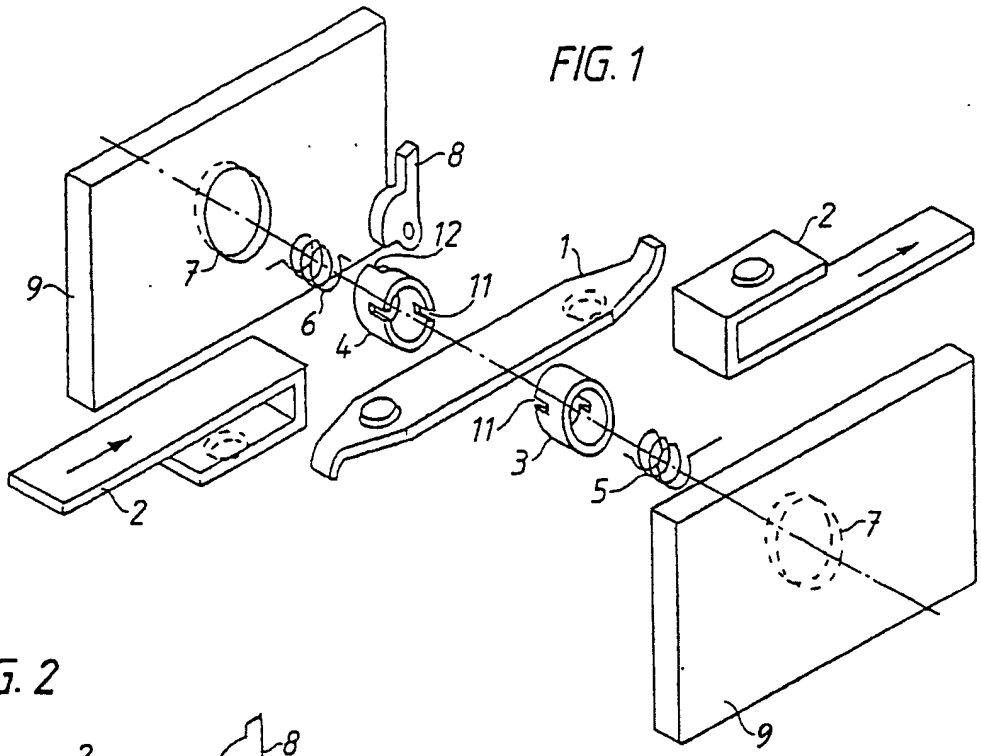


FIG. 2

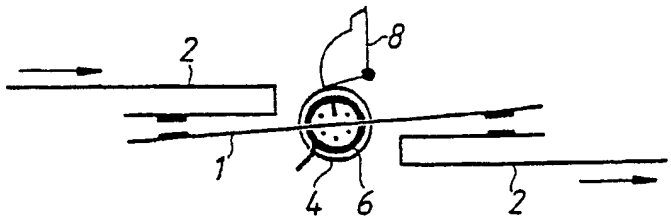


FIG. 3

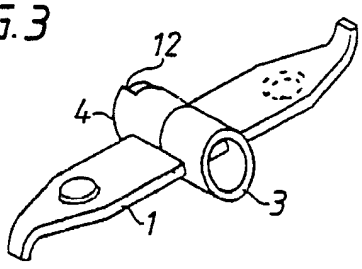


FIG. 4

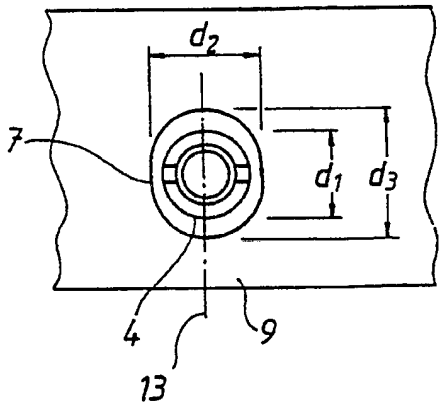
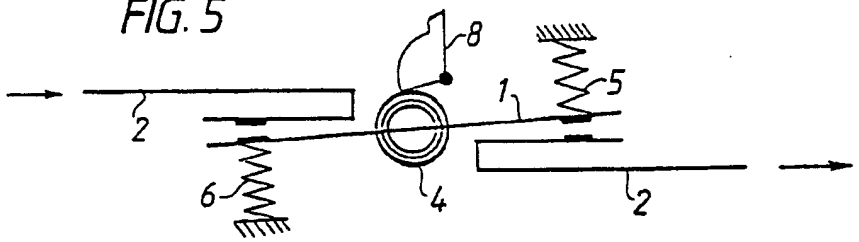


FIG. 5



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EUROPEAN SEARCH REPORT

Application number
EP90107661.2

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int Cl 5)
A	DE-A-2 845 950 (H O M A GESELLSCHAFT FÜR HOCHSTROM-MAGNET-SCHALTER) * The whole document * - - -	1	H 01 H 1/20 H 01 H 77/10
A	EP-A-0 174 904 (SIEMENS AKTIENGESELLSCHAFT) * The abstract * - - -	1,2	
A	EP-A-0 059 475 (MITSUBISHI DENKI KABUSHIKI KAISHA) * Page 3, lines 13-37;page 4, 1-5; figures 1a, b * - - -	1	
A	DE-A-2 157 927 (BROWN, BOVERI & CIE AG) * The whole document * - - -	1,2	

TECHNICAL FIELDS SEARCHED (Int Cl 5)

H 01 H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
STOCKHOLM	25-06-1990	NORDENBERG B.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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